South Australian Holothuroidea, with Descriptions of New Species.

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(Communicated by Dr. E. C. Stirling.)

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Plates II. to IV.

The material which forms the basis of this paper is a collection of Holothuroidea in the possession of the South Australian Museum, Adelaide, and was kindly placed at our disposal by the Honorary Curator, Dr. E. C. Stirling.

The majority of the species represented was collected by Dr. J. C. Verco from an area which may be regarded as lying between latitudes 33° and 37° S. and longitudes 132° and 140° E.

We have to note seventeen species from South Australian waters; this number includes two species not represented in the collection, but which are recorded by Lampert[1] as having been collected at Adelaide.

We describe four species which we believe to be new to science.

The following is a list of the Holothurians included in this paper:—

Holothuria hartmeyeri, Erwe.
Holothuria, sp. indeterm.
[2]*Holothuria fusco-cinerea*, Jäger.
[2] *Holothuria vagabunda*, Selenka.
Stichopus ludwigi, Erwe.
Cucumaria squamata, Ludwig.
Cucumaria inconspicua, Bell.
Cucumaria striata, n. sp.
Cucumaria mutans, Joshua.
Pseudocucumis bicolumnatus, Dendy.
Phyllophorus ventripes, n. sp.
Thyone vercoi, n. sp.
Thyone, sp. indeterm.
Thyone nigra, n. sp.
Colochirus doliolum (Pallas).
Colochirus quadrangularis (Lesson).
Trochodota allani (Joshua).
Caudina chilensis (J. Müller).

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(1) Lampert, Kurt, "Die Seewalzen" (In: Semper, Reisen im Archipel der Philippinen, iv., Bd., 3. Abth.). Wiesbaden, 1885.

(2) Not represented in the collection, but recorded by Lampert.

Family ASPIDOCHIROTAE.

Holothuria hartmeyeri, Erwe, 1913.

Erwe, Willy. "Holothuroidea," in "Die Fauna Südwest Australiens," Band iv., Lief. 9, Gustav Fischer, Jena, 1913, p. 383.

There are two very wrinkled and contracted specimens which we tentatively identify as belonging to Erwe's species. Their condition is quite inhibitive of a determination of the arrangement of the podia. The spicules, however, appear to agree closely, both in form and size, with those of Erwe's species.

Holothuria, sp. indeterm.

There are several specimens of a Holothurian the condition of which is inhibitive of a satisfactory identification.

Stichopus ludwigi, Erwe, 1913.

Stichopus ludwigi, Erwe, p. 388, *antea*.

There is a single example of this species collected in South Australian waters by Dr. J. C. Verco.

The specimen is not in very good condition, the external surface having apparently become somewhat eroded, and it is therefore difficult to determine the arrangement of the podia and papillae. However, the deposits are in good condition in the uneroded portions of the perisome, and are perfectly characteristic of the above species. The length of our example is 120 mm. Colour is fawn, darker dorsally. The dorsal papillae are of a dark-brown tint. The oral opening is placed in a distinctly ventral position, and is surrounded by a rosette-like structure.

Family DENDROCHIROTAE.

Cucumaria squamata, Ludwig.

Cucumaria squamata, Ludwig, 1898, "Holothurien"; in "Ergebn. der Hamburg," Magalhaensischen Sammelreise, Hamburg.

There is one specimen from Encounter Bay. It is of interest to record this species for South Australia.

This specimen is in an excellent state of preservation, and is quite in accord with Ludwig's description, both as to podial distribution and spiculation.

Cucumaria inconspicua, Bell.

1887, Bell, F. Jeffrey, "Holothuroidea, Descriptions of New Species." Proc. Zool. Soc., London, June 21.

1914, Joshua, E. C., "Victorian Holothuroidea, with Descriptions of New Species." Proc. Roy. Soc., Victoria, vol. xxvii. (new series), part i., Melbourne, 1914.

There are three specimens collected by Dr. J. C. Verco. One of us has already commented on the evidently close relationship between this species and *Cucumaria parva*, Ludwig. The South Australian specimens appear in all respects similar to those collected in Victoria.

Cucumaria striata, n. sp.

The two specimens in the collection were obtained by Mr. J. W. Howard in August, 1888, from the Great Australian Bight.

The length is 25 mm. by 12 mm. in breadth. The form is cylindrical, curved dorsally. The podia are confined to the radii, and form on each of the two dorsal radii four fairly regular rows, which diminish anteriorly and posteriorly to two or three rows only. On each of the ventral radii there are five rows, which also lessen in number towards the ends of the body.

The colour of the specimen is inter-radially of a smoky-black, with dirty-white radii, giving a striped appearance.

The calcareous ring is of the usual generic configuration. The deposits are in the form of delicate tables (plate iii., fig. 2), the disc of which is markedly concave, and is perforated with from four to ten holes. The spire, which does not always arise from the centre of the disc, consists of two rods, joined by a transverse beam in the vicinity of the disc, and converging for some distance until they become fused, enclosing a small perforation. Subsequently they again diverge, and terminate in two points only. There is a considerable variation in the number of holes in the disc, but the form of the spire is very uniform. These deposits are not very thickly disposed in the perisome.

The rather striking colouration and peculiar spicules would appear to separate the species from any hitherto described.

Cucumaria mutans, Joshua.

1914, Joshua *(antea), Cucumaria mutans.*

There are two quite typical young individuals collected by Dr. J. C. Verco. This Holothurian is peculiar from the circumstance that during life (and generally in alcohol) it is, while young and half-grown, of a deep blue-black colour, which almost disappears as the animal advances in age, mature specimens being nearly white.

PSEUDOCUCUMIS BICOLUMNATUS, Dendy.

Journ. Linn. Soc., vol. xxvi., No. 166, "Holothurians of New Zealand."

There is an excellently preserved and very typical specimen of this species collected by Dr. J. C. Verco.

PHYLLOPHORUS VENTRIPES, n. sp. Plate ii., fig. 1.

The collection contains several specimens of a *Phyllophorus* which apparently belongs to a species not hitherto described. They were collected by Dr. J. C. Verco.

Description.—Length, about 60 mm.; shape, fusiform, and truncated anteriorly. The podia are restricted to the mid-ventral region, and are numerous and thickly disposed in both the radial and inter-radial areas; a very small number of imperfectly developed podia may occur scattered outside of the region referred to, but the mid-dorsal region for a space of about 30 mm. by 10 mm. is devoid of any podia or papillae. The calcareous ring consists of ten compound members, both the raidial and inter-radial having posterior prolongations (plate iii., fig. 5).

There are no calcareous deposits in the perisome. The podia are provided at their terminations with cribriform plates and supporting rods. The tentacles, twenty in number and disposed in the typically generic manner, contain stout branched rods having expanded perforated ends which are often bifurcated.

The most remarkable feature of this species is the distribution of the podia. We know of but one other species in which that feature is the same, *viz.*, *Thyone meridionalis*, Bell, and but for the circumstance that the arrangement of the tentacles in our species is quite typical of the genus *Phyllophorus*, we should not have hesitated to identify it with that of Bell, since it agrees well with the latter in all other respects.

THYONE VERCOI, n. sp.

There is a single specimen collected by Dr. J. C. Verco. The animal is of a brown colour, and apparently considerably contracted. Its length is 36 mm., and it tapers both posteriorly and anteriorly, the latter extremity being truncated. The podia appear to be thickly disposed over the whole of the body, but are, perhaps, not quite so numerous on the dorsal surface; no arrangement in rows is discernible anywhere. The calcareous ring is of substantial build, and consists of ten composite members, the radial pieces being prolonged posteriorly. The tentacles are ten in number, the dorsal being about two and one-half times as long as the ventral.

There is a single polian vessel and but one madreporite. Dependent from the anterior region of the interior of the pharynx are over one hundred digitiform processes, the nature of which is discussed elsewhere. The deposits in the perisome consist of cruciform bodies with spinous processes projecting in a plane perpendicular to their surface (plate iii., fig. 1,*a*,*b*,*c*,*d*). The arms of the cross are in some cases produced so as to form a hole. The spicules give one the impression of being in a developing stage. The species appears to differ from any previously described, but *Thyone sacellus*, Selenka, would seem to be a near relative. The latter, however, differs in the form of the calcareous ring, and, moreover, the spicules of our present species could not very well, even if they be regarded as not fully developed, proceed to the form of those found in *T. sacellus*.

Thyone, sp. indeterm.

There is a single specimen of a *Thyone*, in which calcareous deposits are completely wanting. Their absence from the perisome would not be regarded as inhibitive of a determination, but as they have in this case disappeared from the tube-feet, where there is some evidence of their having been previously present, we do not care to endeavour to identify the species.

Thyone nigra, n. sp.

One specimen collected by Dr. J. C. Verco.

Description.—Shape fusiform, the posterior and anterior ends being upturned. Podia distributed without arrangement all over the body. Tentacles ten, frondose; the dorsal are about double the length of the ventral. Colour, deep purplish-black, podia white. The calcareous ring consists of ten processes (plate iii., fig. 4), having prolongations posteriorly. Calcareous deposits are thickly disposed throughout the perisome; they consist of tables of two kinds (plate iii., fig. 3). The first, which measure about 0·096 mm. × 0·064 mm., are of an irregular oblong shape; the disc is flat, and is pierced with four large central holes. These form a cross. There are other holes, which are irregularly disposed. The spire of the table is very short; it consists of two rods which are joined only at their extremities, which are spinous. The second kind of table consists of a rhomboidal plate, pierced as in the first-mentioned with four central holes and with a few holes at each extremity. The plate is distinctly concave, the spire is similar to that in the first kind; these rhomboidal plates occur exclusively in the skin of the podia. Internally the anatomy shows

no peculiarities; the single polian vessel is, however, very large in proportion to the size of the animal, measuring 3 mm. × 1·5 mm. We believe the above species to have been hitherto undescribed. Ludwig's *Thyone similis* is, perhaps, its closest relative.

Colochirus doliolum (Pallas).

For synonymy see Erwe, Willy, *antea*.

Numerous characteristic specimens from various stations. The species evidently has a range embracing the whole Southern Australian coastline.

Colochirus quadrangularis (Lesson).

For synonymy see Erwe, Willy, *antea*.

There are two excellently preserved specimens of this well-characterized species. They were collected in the Great Australian Bight by Mr. J. W. Howard.

Family SYNAPTIDAE.

Trochodota allani (Joshua).

(3) 1912, Joshua, *Taeniogyrus allani*.
(4) 1912, Dendy, *Chiridota allani*.
(5) 1913, Joshua, *Trochodota allani*.

A single typical specimen from Kangaroo Island. It is interesting to note the occurrence of this species so far west of its hitherto recorded habitats.

Family MOLPADIIDAE.

Caudina chilensis (J. Müller).

For synonymy see "Dendy and Hindle." (6)

This species is represented by over forty specimens collected in various localities off the South Australian coast. Very great variation is exhibited in the size and form of the individuals, and to some extent also in their colour and spiculation. The series furnished specimens of which the largest measured 125 mm. in length and about 60 mm. in breadth,

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(3) On a new Holothurian of the genus *Taeniogyrus*. Proc. Roy. Soc., Victoria, vol. xxv. (new series), part i., Melbourne, 1912.

(4) Jour. of the Quekett Microscopical Club, ser. ii., vol. xii., No. 72, pp. 105 to 107, 1912.

(5) 1914, *antea*.

(6) Jour. Linn. Soc., vol. xxx., Zoology, London, 1907.

and were of massive build, but with no approach to the caudate character assigned to this species; the colour was yellow, with patches of rusty-pink: the spiculation was perfectly specific, as were also the calcareous ring and the tentacles.

At the other end of the scale we got individuals of about 70 mm. in length, white in colour, and markedly caudate, the "tail" portion being one-half the length of the animal, and constricted abruptly at its junction with the body; the ring, ossicles, and tentacles were specific. The remaining specimens furnished links between the two extremes given above.

We do not at present propose to enter upon a taxonomic review of the family Molpadiidae, but would point out that this great variation in form occurring in one species makes it doubtful whether the division into the two genera *Molpadia* and *Caudina* is justifiable.

On some Structures found in the Pharynx of *Thyone vercoi*, n. sp.

In making the necessary dissections for the identification of the several species contained in this collection, our attention was drawn to some very unusual structures occurring in the pharynx of *Thyone vercoi*, n. sp. The pharynx, on being opened, displayed a large number (over 100) of small pedunculated processes depending in several somewhat irregularly disposed rows from the whole of its inner surface (plate ii., figs. 2, 3, and 4; plate iii., fig. 1,*e,f,g;* plate iv.). These processes measured from 2 to 4 mm. in length, and averaged about 1 mm. at their greatest diameter. Their colour was a dead white, and they were very conspicuous. The white colour was shown by microscopical examination to be due to a dense aggregation of calcareous particles, foliaceous in form, and measuring about 0·048 mm. in length (plate iii., fig. 1,*e,f,g).* These particles coalesced to form a reticulated mass in the interior of the process. After decalcification, longitudinal sections were cut of one of the processes with a portion of the pharyngeal wall from which it depended. The wall of the pharynx was found to be histologically normal; the processes were extensions of this normal tissue, the longitudinal muscles not being, however, continued into them, but proceeding in a direct line along the pharyngeal wall. The connective tissue of the interior of these processes was almost entirely replaced by the mass of ossicles already referred to. The structure cannot be homologized with any part of the recorded anatomy of Holothurians, but a remark by

Ludwig,[7] which we quote herewith, appears to have some bearing on the subject:—

"Hier aber sind noch einige Anhangsgebilde zu erwähnen, welche bei einzelnen Arten vorkommen. So beschreibt Selenka, dass er an je einem Exemplare von *Mülleria mauritiana* und *miliaris* (Quoy und Gaim.) rundum am Ringkanal eine grosse Zahl von kleinen, etwa 2/3 mm. dicken, gestielten Bläschen gefunden habe, welche unmittelbare Ausstülpungen des Ringkanales darstellen. In ihrem Inneren liegen Hunderte von kleinen, ellipsoiden, isolirten Zellen, deren vorderes Ende sich tutenförmig öffnet, während das hintere einen langen Faden trägt; erfüllt sind die Zellen von kleinen Fetttröpfchen. Selenka vermuthet in diesen Zellen parasitäre Gebilde.* Dagegen scheinen die kleinen, zahlreichen Blindsäcke, welche Théel bei seinem *Ilyodaemon maculatus* und anderen Elasipoden am Ringkanale beobachtete, normale Bildungen zu sein.

"*Weshalb (Lampert, pp. 6 and 7) in den oben geschilderten, von Selenka erwähnten Bläschen Steinkanäle sehen will, ist mir ebenso unverständlich wie seine fernere Behauptung, dass jene Bläschen, sicher dieselben Gebilde sind, deren Semper und Ludwig bei Beschreibung neuer Colochirus-Arten Erwähnung thun und die sie als Steinkanäle bezeichnen."

Now in reference to the above remarks we think that there is very little doubt that Selenka's assumption of the parasitic nature of the structure mentioned by him is correct. The bodies he describes and figures closely resemble the sporocytes of a gregarine, an organism, species of which are not infrequently found infesting Holothurians. The real nature of the structure found in *Thyone vercoi*, n. sp., is rendered obscure by reason of the character of the contents of the processes—a very definite aggregation of calcareous spicules with no indication of any structure at all resembling that described by Selenka. Further than the above description we are not at present prepared to go. It may be pathological in its origin, or may, on the other hand, be a perfectly normal structure.

DESCRIPTION OF PLATES.

Plate II.

Fig. 1. *Phyllophorus ventripes*, n. sp., lateral view.
,, 2. *Thyone vercoi*, n. sp. Pharynx opened longitudinally, showing masses of processes containing calcareous deposits. *Enlarged.*
,, 3. Two of the processes further enlarged.
,, 4. The "neck" of a process further enlarged to show the character of the contained ossicles.

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[7] Bronn, Klassen und Ordnungen des Thier-Reiches. Echinodermen, I. Buch., "Die Seewalzen," p. 112.

Plate III.

Fig. 1. *Thyone vercoi*, n. sp.
a,b,c,d—Various ossicles from perisome, × 200.
e,f,g—Ossicles from pharyngeal processes and from tentacles, × 200.

,, 2. *Cucumaria striata*, n. sp.
a,b,c,d—Ossicles from perisome, × 275.

,, 3. *Thyone nigra*, n. sp.
a,b,c—Ossicles from perisome, × 250.
d,e—Ossicles from tube feet, × 250.

,, 4. *Thyone nigra*, calcareous ring. *Enlarged.*

,, 5. *Phyllophorus ventripes*, calcareous ring. *Enlarged.*

Plate IV.

Thyone vercoi. Diagram of a section of the pharyngeal wall and of a single process dependent therefrom.

a—Spicules as in plate iii., fig. i., *e,f,g*.
b—Endothelium.
c—Lymphocytes.
d—Longitudinal muscle.
e—Connective tissue.
f—Circular muscle.
g—Peritoneum.

Fig 1

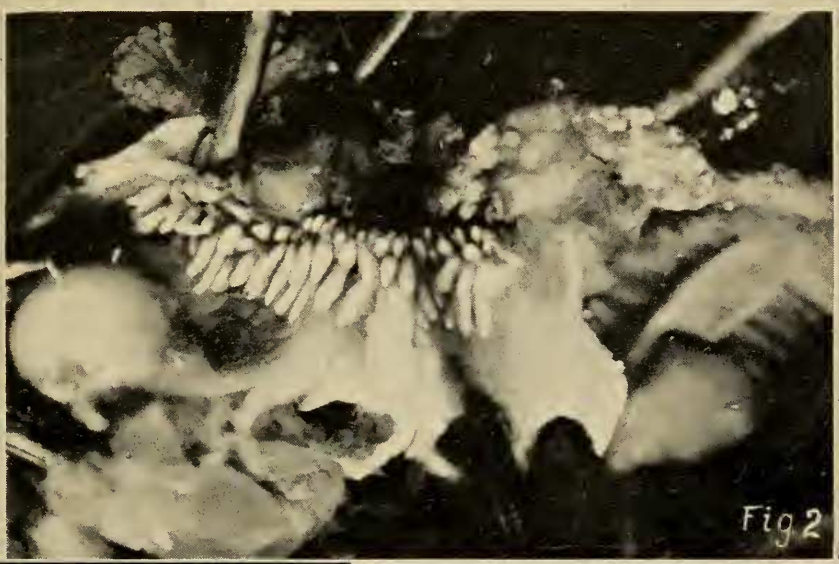

Fig 2

Fig. 3

Fig 4

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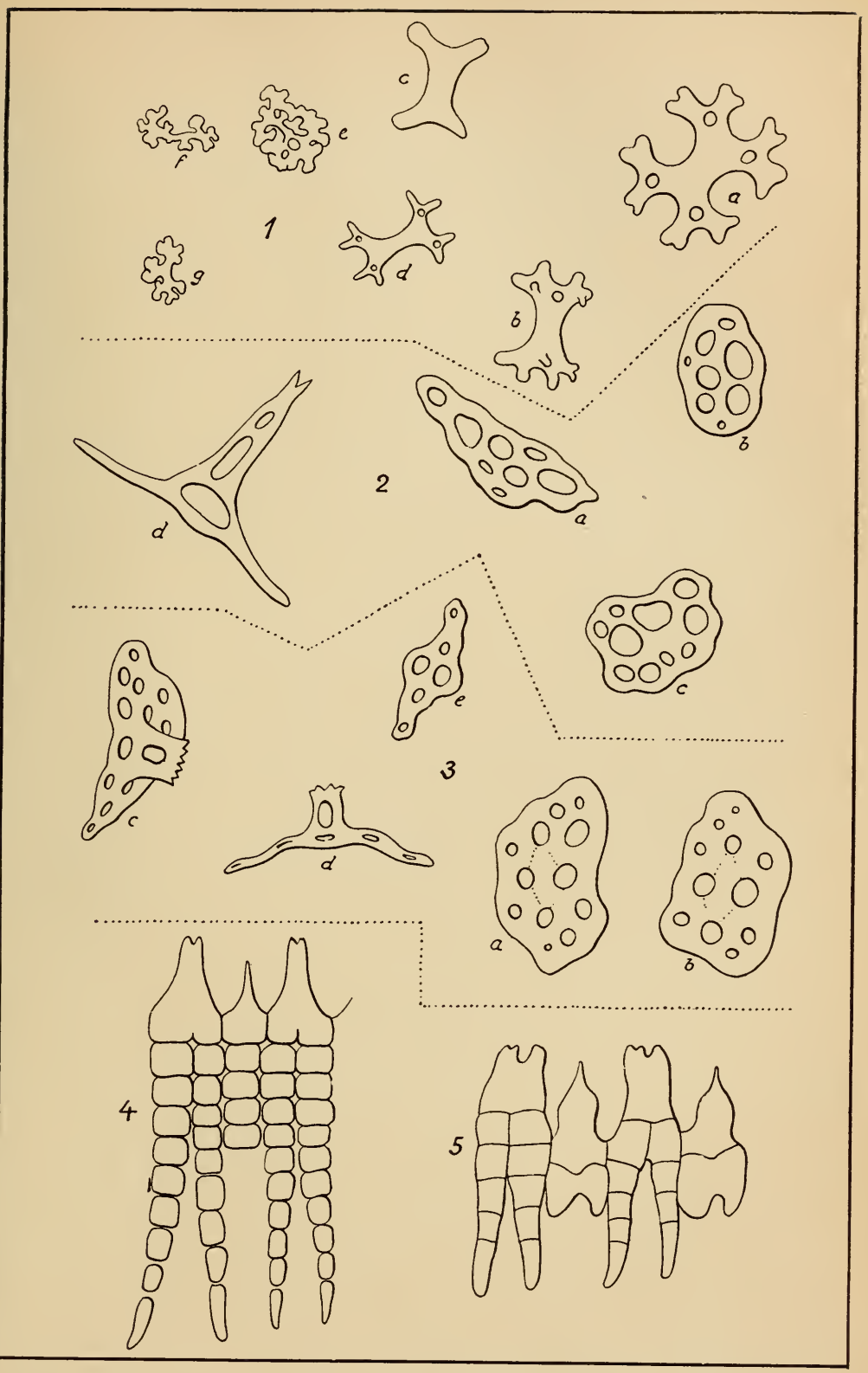

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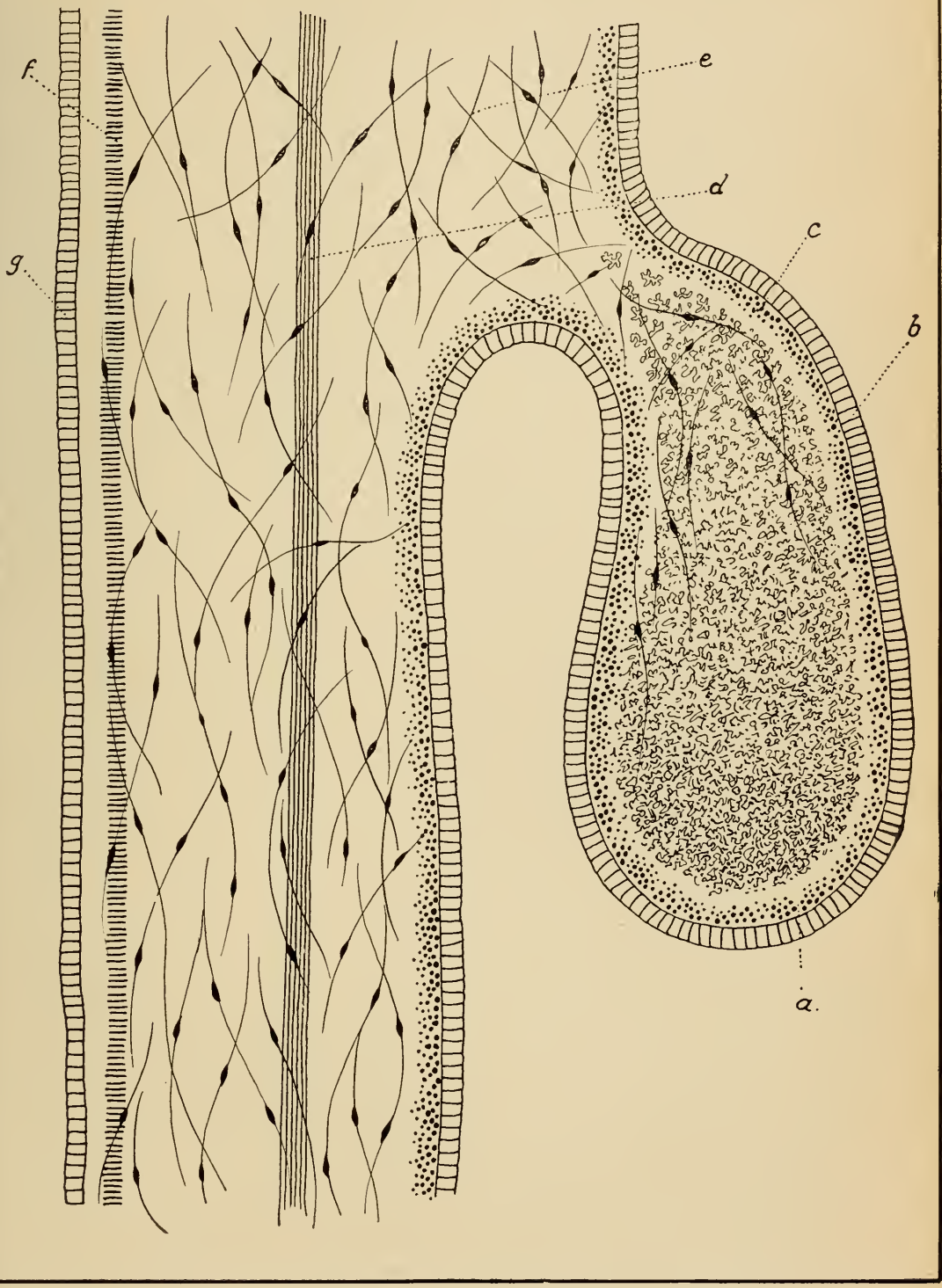

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